# Method

## Study Design

The sleep diary measures were analyzed with the baseline scores of 163 participants randomly assigned to any of the intervention groups. The measures of sleep–wake patterns were sleep efficiency (%), sleep onset latency (SOL; min), wake time after sleep onset (WASO; min), and total sleep time (min).

## Data analysis

We used R version 4.3.0 (R Core Team, 2023) for all our analyses. For the assessment of the sleep diary variables, we fitted Generalized mixed models (GMM) using the package glmmTMB version 1.1.7 (Brooks et al., 2017) with Gaussian (total sleep time), zero-inflated Gamma (WASO and SOL), and beta (sleep efficiency) distributions. To decide on the most appropriate family, we first generated density plots of the raw dependent variables and then, after selecting a candidate family, examined the QQ plot of residuals and residuals vs. fitted plot to verify homoscedasticity, normality of residuals, and influential cases. Model diagnostics were assessed with the DHARMa package version 0.4.6 (Hartig, 2022).

## Results

The analysis of the covariates showed that age was a significant predictor of WASO and total sleep time. Holding all other predictors constant, a one-year age increase leads to an increase of 0.02 minutes in wake time after sleep onset and a decrease of 1.58 minutes in total sleep time. We also found that being male leads to a relative change of 32% in sleep efficiency and a decrease of 0.42 minutes in sleep onset latency. A university degree was associated with a relative change of 41% in sleep efficiency and a 36.7 increase in total sleep time.

Regarding the personality traits, we found that holding the other predictors constant, a one-point increase in the standardized Extraversion score led to a relative change of 1% in sleep efficiency and a decrease of 0.02 minutes in WASO.

**Table 1.** Results from the regression models.

|  |  |  |  |
| --- | --- | --- | --- |
| Sleep diary measures | Estimate [95% CI] | SE | p-value |
| *Sleep efficiency (%)* |  |  |  |
| Intercept | -0.47 [-1.56, 0.62] | 0.55 | 0.40 |
| Age | 0.00 [-0.01, 0.01] | 0.00 | 0.88 |
| Sex [male] | 0.27 [0.04, 0.51] | 0.12 | 0.02 |
| University degree [yes] | 0.34 [0.11, 0.58] | 0.12 | 0.00 |
| Neuroticism | 0.00 [-0.01, 0.01] | 0.00 | 0.55 |
| Extraversion | 0.01 [0, 0.02] | 0.00 | 0.04 |
| Agreeableness | 0.01 [0, 0.02] | 0.00 | 0.06 |
| Conscientiousness | 0.00 [-0.01, 0.01] | 0.00 | 0.54 |
| Openness | 0.00 [-0.01, 0.01] | 0.00 | 0.61 |
| *Sleep onset latency (min)a* |  |  |  |
| Intercept | 5.08 [3.54, 6.62] | 0.79 | <0.001 |
| Age | -0.01 [-0.02, 0] | 0.00 | 0.17 |
| Sex [male] | -0.42 [-0.74, -0.11] | 0.16 | 0.01 |
| University degree [yes] | -0.32 [-0.64, 0] | 0.16 | 0.05 |
| Neuroticism | -0.01 [-0.02, 0.01] | 0.01 | 0.31 |
| Extraversion | 0.00 [-0.01, 0.01] | 0.01 | 0.78 |
| Agreeableness | 0.00 [-0.01, 0.01] | 0.01 | 0.72 |
| Conscientiousness | -0.01 [-0.02, 0] | 0.01 | 0.09 |
| Openness | 0.01 [0, 0.02] | 0.01 | 0.08 |
| *Wake time after sleep onset (min)a* | |  |  |
| Intercept | 3.83 [1.96, 5.69] | 0.95 | <0.001 |
| Age | 0.02 [0.01, 0.03] | 0.01 | <0.001 |
| Sex [male] | -0.27 [-0.62, 0.08] | 0.18 | 0.13 |
| University degree [yes] | -0.14 [-0.5, 0.23] | 0.19 | 0.46 |
| Neuroticism | 0.00 [-0.02, 0.01] | 0.01 | 0.84 |
| Extraversion | -0.02 [-0.04, -0.01] | 0.01 | 0.00 |
| Agreeableness | 0.00 [-0.02, 0.01] | 0.01 | 0.60 |
| Conscientiousness | 0.00 [-0.01, 0.01] | 0.01 | 0.99 |
| Openness | 0.00 [-0.01, 0.02] | 0.01 | 0.52 |
| *Total sleep time (min)* |  |  |  |
| Intercept | 301.74 [166.41, 437.08] | 69.05 | <0.001 |
| Age | -1.58 [-2.55, -0.62] | 0.49 | <0.001 |
| Sex [male] | -8.13 [-35.79, 19.53] | 14.11 | 0.56 |
| University degree [yes] | 36.7 [7.35, 66.04] | 14.97 | 0.01 |
| Neuroticism | 0.77 [-0.32, 1.85] | 0.55 | 0.17 |
| Extraversion | 0.89 [-0.2, 1.97] | 0.55 | 0.11 |
| Agreeableness | 0.33 [-0.8, 1.45] | 0.57 | 0.57 |
| Conscientiousness | 0.04 [-1.14, 1.21] | 0.60 | 0.95 |
| Openness | 0.48 [-0.55, 1.51] | 0.53 | 0.36 |

Note: aResults for the conditional models. None of the coefficients from Zero-inflation models were statistically significant.

**References**

Brooks, M. E., Kristensen, K., van Benthem, K. J., Magnusson, A., Berg, C. W., Nielsen, A., Skaug, H. J., Maechler, M., & Bolker, B. M. (2017). glmmTMB balances speed and flexibility among packages for zero-inflated generalized linear mixed modeling. *The R Journal*, *9*(2), 378–400. <https://doi.org/10.32614/RJ-2017-066>

Hartig, F. (2022). *DHARMa: Residual diagnostics for hierarchical (multi-level / mixed) regression models*. <https://CRAN.R-project.org/package=DHARMa>

R Core Team. (2023). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>